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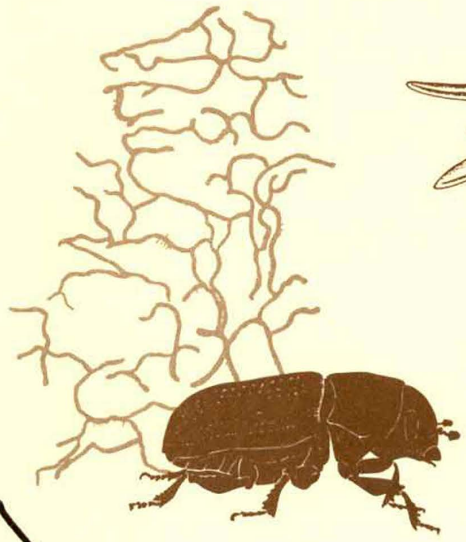

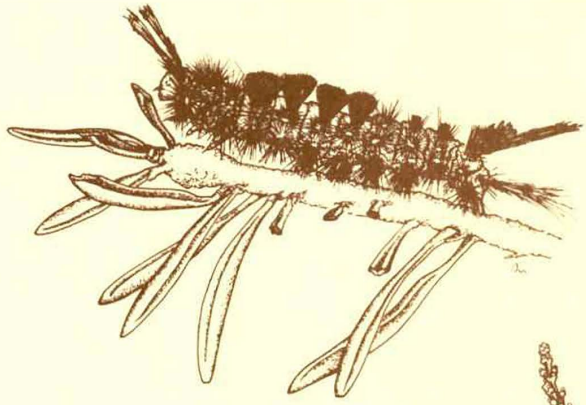

IDAHO DEPARTMENT OF LANDS

SPRUCE BEETLE

and

DOUGLAS-FIR BEETLE SURVEY

with

MANAGEMENT RECOMMENDATIONS

for the

PAYETTE LAKES ADMINISTRATIVE AREA

by

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and

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Coeur d'Alene, Idaho

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INTRODUCTION

At the invitation of Sheldon Keffer, Forest Area Manager, we visited the Payette Lakes Area to look at bark beetle problems. On September 25-27, we surveyed the drainages on the east side of Payette Lake and of the North Fork of the Payette River between Elip Creek and Brush Creek. There has been a considerable amount of spruce beetle and Douglas-fir bark beetle activity taking place over the past several years. Area personnel are concerned that the infestation will continue with a complete loss of the spruce and Douglas-fir resource.

OBSERVATIONS

MAP #1

MAP SPOT #1 Lemah Creek bark beetle attack group

This stand is composed of 60 percent grand fir, 30 percent spruce, 5 percent Douglas-fir, 3 percent ponderosa pine, and 2 percent larch. Further up the slope, the percent of spruce increases.

Grand fir, *Abies grandis* (Dougl.) Lindl.
The grand fir ranges from 10 inches up to 36 inches dbh. There are only a few in the smaller size classes. They all appear quite decadent. Many trees have Indian Paint fungus *(Echinodontium tinctorium* E.& E.) conks on them. Some are dead from attack by the fir engraver, *Scolytus ventralis* LeConte.

Spruce, *Picea engelmannii* Parry
The spruce ranges from 8 to 10 inches to over 40 inches dbh; the majority are 16 to 36 inches.

Approximately 50 - 60 percent of the spruce in this area have been attacked by the spruce beetle, *Dendroctonus rufipennis* (Kirby). We found a few very old attacks (three or more years ago), two year old attacks, currently fading that were attacked last year, and trees that have been attacked this past spring. The beetles appear to have emerged from 1990 attacked trees, however, there are high populations of larvae, pupae and callow adults in the 1991 attacked

trees. Boring frass is very evident, but often can only be seen at close distances. The needles have begun dropping from the newly attacked trees and cover the ground. However, the crowns still appear green.

Douglas-fir, *Pseudotsuga menziesii* Franco
The Douglas-fir averages 32 inches in diameter, many of which have been attacked by the Douglas-fir bark beetle, *Dendroctonus pseudotsugae* Hopkins.

Ponderosa pine, *Pinus ponderosa* Laws
The ponderosa pine are all large, 32 to 36 inches dbh. They are all alive, and, except for being decadent, seem to be in good condition. No bark beetle attacks were seen.

Western larch, *Larix occidentalis* Nutt.
All larch are dead. They are very large, 36 to 40 inches dbh.

About halfway between map spots 1 and 2, we found a stand of approximately 75 small spruce ranging from 10 to 14 inches dbh, which have been successfully attacked by the spruce beetle this season. They are not fading and have not shown any needle drop yet.

MAP SPOT #2 Lemah Creek bark beetle attack group

In this basin, the stand composition is 90 percent spruce, ranging from about 16 to 40 inches dbh, averaging 24-30 inches dbh. The remaining species include larch, Douglas-fir, and ponderosa pine on the dryer micro sites, and grand fir in the wetter locations.

In the spruce, there are a few old spruce beetle attacks, 1990 attacks, and many current 1991 attacks. The new attacks are discovered mainly by seeing pitch tubes and boring frass on the tree bases or by seeing woodpecker work. The boring frass is often seen only from a close distance. The crowns are still green in these trees, and there is little or no needle drop.

In the area where the proposed road contacts the northern edge of this spot, nearly 100 percent of the spruce trees have been attacked. We find all stages of beetle development in these trees. Some trees were strip attacked last year and they now have new, 1991, mass attacks. Many trees that have been recently attacked have significant amounts of boring frass on their bases.

We found western pine beetle in ponderosa pine and Douglas-fir beetle in Douglas-fir. There are very few of these hosts in this area.

On the ridge top crossing from Lemah Creek into Elip Creek we found a number of large grand fir, some of which have been killed or top killed by the fir engraver. The Douglas-fir is all large, old, and overmature. Many have been attacked by the Douglas-fir beetle, either last year or this year with current 1991 attacks. It appears that the beetle population is building up in this area.

MAP SPOT #3, Elip Creek

In the basin area of Elip Creek, an average of 80 percent of the spruce have been attacked, primarily this year. Those that have not been attacked are smaller trees in the 12- to 14-inch size. Of the trees larger than 20 inches, 95 percent have been attacked. These newly attacked trees have green, healthy looking crowns, although needle drop is just starting. Some of these trees already have some woodpecker activity.

A few trees have resisted the attack of the beetles. These have either pitch streaming high up on the bole, or extra large, fresh-looking pitch tubes at the base of the trees, with unsuccessful attacks under the bark. The pitch tubes of successfully attacked trees are generally small, approximately 1/2 inch across, and quite dry with a relatively small amount of resin. However, because the unsuccessful attacks will weaken the trees and the beetle populations are very high, it is very likely that these trees will be successfully attacked in succeeding years.

MAP SPOT #4

This site is on the ridge, along the line between sections 11 and 12, at the junction of the proposed main road and the spur road. All large spruce are attacked.

MAP SPOT #5, Culvert site #13

In the saddle where the proposed road crosses the ridge, the larger spruce trees have been attacked. There is also a pocket of very large, old, overmature Douglas-fir, but there are no signs of beetle attack. In the draw at the culvert site, there are many large, old spruce. Most have green crowns, but approximately 75 percent of them show evidence of attack. Those that

have not been attacked are the smaller trees in the 12- to 14-inch size.

Near the proposed road that crosses approximately in the middle of section 12, we have seen scattered, old windthrown spruce. I suspect that this has been a major contributing factor to the start of the outbreak in this site.

MAP SPOT #6 Culvert Site #17, False Elip Creek

In the draw bottom nearly 100 percent of the larger trees show signs of beetle attacks. Some of them appear to be resistant, often with pitch streaming from 30 to 60 feet up the bole. We had no way of determining the success of the attack at that height.

The successfully attacked trees contain predominantly larvae. This has been the case in basically all of the Elip Creek timber sale area and the surrounding ground. This suggests that the attacks took place the spring of 1991.

MAP SPOT #7

This site is a long arm of the timber sale, in a shallow draw. There are many large, old spruce present, 80 percent of which have been successfully attacked by the spruce beetle.

MAP SPOT #8

In between the arms of the road, in sections 11 and 14, there is a stand of large, over mature Douglas-fir. It is highly susceptible to bark beetle attack, but no attacks were seen.

MAP SPOT #9 Cutting Unit 1

Thirty to forty percent of the large spruce trees are dead. The remainder have green crowns, but it appears that nearly 100 percent of them have been attacked this year.

MAP #2

MAP SPOT # 10 Brush Creek area

This is primarily a small stand of lodgepole pine, *Pinus contorta* Dougl. We did not see any beetle attacks in the lodgepole. There are also many pockets of subalpine fir, *Abies lasiocarpa* (Hook.) Nutt., averaging 16 inches dbh, intermixed around the lodgepole. Many of the subalpine fir have been attacked by the western balsam bark beetle, *Dryocoetes confusus* Swaine. In adjacent areas there is a large component of spruce much of which is also in pockets. Many of these have been attacked by beetles; some successfully, some with patch or strip attacks, and some unsuccessfully with a heavy flow of light-colored pitch streaming down the trunk.

MAP SPOT # 11 Brush Creek area

This is a small stand of nearly pure, large, old spruce. Eighty-five percent of the existing spruce are already killed. Of the remaining, nearly 100 percent have been attacked.

MAP SPOT # 12 Brush Creek area

This is a stand, nearly pure to large, old spruce. Out of 63 trees examined, 85 percent were not attacked, with 15 percent showing some indication of attack. Several large spruce trees have recently been cut in this block. We checked stumps and found no indications of beetle attacks in them at this time. However, there were some longbutts, broken tops and high stumps that will definitely attract spruce beetles and serve as breeding sites contributing to future activity in this area. This is a high risk site that will probably be attacked in the near future.

MAP SPOT # 13 Brush Creek area

The stand is predominantly large, old spruce with many 1990 beetle killed trees. Only 15 to 20 percent of the trees have green crowns. Of these, approximately 50 percent appear to be successfully attacked this year.

Between sites 10 and 13, we found many more successfully attacked spruce.

MAP SPOT # 14 Box Creek

East of the creek, along the edge of an old clear-cut, there is a fringe of 60 percent spruce, and 40 percent true firs, both grand fir and subalpine fir. There was no sign of beetle attacks in any of these trees.

On the west-facing slope above the clearcut, there is a dense stand of predominantly old, mature Douglas-fir, averaging 24 inches dbh. Most of the trees appear healthy with pointed crowns and good growth. There are many old Douglas-fir beetle groups in these stands, but we found only 12 scattered individual trees with 1991 attacks. There are probable others in the vicinity. Most of the old attacks are from 1990, with a few from 1989. Trees in these old attack groups have very few needles left on them.

MAP SPOT # 15 Box Creek

On the south side of Box Creek, we found one small 1991 Douglas-fir beetle spot, and two heavily attacked spruce.

MAP #3

MAP SPOT # 16 Box Creek

This is a small draw that empties north into the Box Creek. It is full of very large spruce. In the draw bottom, at least 95 percent of the trees have been successfully attacked in 1991. Any buffer trees left along this draw will be killed by the beetles. This area should be included in the Box Creek timber sale.

Along the eastern side of cutting unit 5 of the Box Creek timber sale south of spot 16, the spruce is unattacked. These trees are slightly smaller in size than those seen previously. In the southeast corner of cutting unit 5 the spruce is also unattacked even though it is large in size. A large percentage of the stand in this area is large, old, overmature Douglas-fir. It has high

potential for bark beetle attack, even though none were found.

MAP SPOT # 17 Bark beetle attack group

Douglas-fir beetle activity has been heavy with many 1990 attacks. Adjacent to the cutting boundary on the south end of the timber sale at the top of a ridge, we found a large group of 1991 bark beetle attacks in Douglas-fir. The attacked trees are interspersed in and around subgroups of 1990 attacks. The spruce at this site are unattacked.

MAP #4

Fisher Stix Timber Sale.

We traversed the slope on the east side of the river, starting opposite the mouth of Fisher Creek continuing along the brow of the slope looking into the creek to approximately the mid point of section 23, then doubled back across the slope to the south, angling down through the steep ground that is heavy to Douglas-fir.

Throughout this sale there is a large volume of 1989 Douglas-fir beetle killed trees, with a lesser and more concentrated volume of 1990 kills. We found only one 1991 spot which contained 35 newly attacked trees (MAP SPOT # 18).

It does not appear that there is any imminent threat of continuing significant Douglas-fir bark beetle damage in the near future. However, the stand is large, old, overmature, and in a very susceptible condition. Therefore, it will only be a matter of time until another outbreak gets started. There probably will be isolated spots of 30 to 50 trees that continue to showup on this hillside, and across the river, each year.

On the west-facing slope there are some large, old grand fir marked to cut that did not appear to have any commercial value. We see no reason to cut them.

DISCUSSION

SPRUCE BEETLE

A very high percentage of the larger spruce in all areas surveyed have been attacked and killed by the spruce beetle. In most areas, only those trees less than 12 inches dbh have not been heavily attacked. In the current outbreak, spruce mortality on USFS lands of the Payette National Forest, has been measured at 77 to 95 percent in trees ≥12 inches dbh (Mocettini 1991). Most of the spruce found throughout the areas surveyed are large and old, averaging 20 to 30 inches dbh. Stands in the area often contain 90 percent or more spruce. Spruce stands of this nature are at high risk from being attacked by the spruce beetle (see Appendix A, Table 1).

The outbreak of this beetle currently in the Payette Lakes area was first discovered in 1985 (Schwandt and others 1986, Mocettini and Cahill 1989) and has continued to the present. This outbreak apparently originated in windthrow that occurred in 1981 and 1982. This correlates with the initiation of other outbreaks, as Schmid and Frye (1977) state that all known outbreaks have originated from blowdown, cull, or right-of-way logging. The persistence of this outbreak and the high rate of successful attacks found in this survey are likely related to the high mean stand age at the start of the outbreak, the high summer temperatures that have occurred with the recent drought, and the high percentage of spruce in the stand (Safranyik and others 1990). The high summer temperatures allow most of the beetle population to complete development in a single season rather than the normal two-year cycle, thus increasing the population more rapidly (Safranyik and others 1990).

In many other outbreaks of the spruce beetle, the infestation has generally continued until the majority of the mature trees have been killed. From Alaska to Colorado, overstory trees have been reduced as much as 99 percent (Schmid and Frye 1977). In outbreaks that have occurred in northern Idaho and western Montana nearly all of the stands having large diameter spruce trees were infested, and a large percentage of the trees were killed (Gibson and Oakes 1981, McGregor and others 1981, McGregor and Honing 1970, Anon. 1955, Evenden 1953). The current outbreak in the Payette Lakes area has resulted in the killing of hundreds of thousands of trees (Beckman and others, report in preparation).

Once an outbreak starts, prompt action is generally necessary to avoid extensive tree killing and associated losses. Even if IDL is able to control the beetles, there will often be adjacent infested lands of other ownerships, creating a high probability that beetles will reinfest. Management options include silvicultural treatment of high risk stands and activities aimed at

controlling beetle populations. These are outlined in Appendix A. **Harvesting of high hazard stands is the most sure method to avoid losses to the state endowments.**

DOUGLAS-FIR BEETLE

The Douglas-fir encountered throughout the areas surveyed are, almost without exception, at very high risk from attack by the Douglas-fir bark beetle. This is due to a predominance of large, old trees in relatively pure, and in many places, dense stands. The risk of attack is increased by the recent and continuing drought in the area.

The Douglas-fir beetle outbreak currently present in the North Fork of the Payette River Canyon and adjacent areas appears to have resulted from a combination of susceptible stand conditions and from stressing of the trees by the drought. Usually, Douglas-fir beetle outbreaks are initiated by the occurrence of windthrow or winter damage, but there is relatively little evidence of this happening, at least not recently.

An outbreak of the Douglas-fir beetle will usually last two to three years at any given site. This appears to be the case with the Payette River canyon infestation as the first damage apparently occurred in 1988, peaking with the attacks in 1989 and declining significantly in 1990 when we found only two new beetle groups on the east side of the river. In our 1991 survey we found only one freshly attacked group in this same area (Map 4). From our survey, this outbreak appears to have declined in these stands.

Anticipating that the normal pattern of infestation will continue, it is not likely that we will suffer further significant mortality in the immediate future, especially in the canyon of the North Fork of the Payette River. However, as stated, all stands encountered in our survey are in a highly susceptible condition. The drought conditions may also continue, exacerbating the weakness of the trees. Even if there is above normal precipitation this winter, the trees cannot completely regain their resistance in one season. Future windthrow or snow breakage would initiate another outbreak. Thus, to avoid beetle damage, these stands should be considered for harvest and management activities at the earliest possible opportunity. Management options are outlined in Appendix B.

VISUAL CORRIDOR OF THE NORTH FORK OF THE PAYETTE RIVER

The visual corridor of the North Fork of the Payette River, as seen from the highway along the river, needs to be given special consideration. The public is generally much more concerned about logging activities than of trees killed by natural causes. With the current level of marking in the sale area, there will be a very obvious difference in the visual quality of the corridor. Leaving all grand fir on the site would help alleviate this impact to some degree, but probably not enough to make the harvest cut that much less noticeable.

Another consideration is the hiding and thermal cover provided to big game that use the river canyon area as evidenced by the many game trails and other signs of habitation by elk and deer. This protection would be reduced by harvesting the area.

Given these considerations, there may be greater value in leaving the scenic river corridor untouched than in logging it.

RECOMMENDATIONS

SPRUCE BEETLE

1. Since the stands encountered throughout the survey are both in a very high risk condition and have been, to a large degree, already attacked by the spruce beetle, we recommend that all susceptible stands be harvested as quickly as possible. Salvage and sanitation of infested trees should have high priority in order to avoid degrade of the timber due to checking and decay. Compliance with Forest Practices Act is required, but it is very unlikely that there will be many trees left alive in stream-side buffers. Clear cuts larger than 30 acres will undoubtedly be required as such a high percentage of the trees have already been successfully attacked by the beetles. In order to preserve some spruce in the area, unattacked stands that have an average diameter of 12 inches dbh or less should be left as long as they have site and stand characteristics that will provide for wind firmness.

DOUGLAS-FIR BEETLE

1. Since the existing Douglas-fir stands throughout the area are in a high risk condition being very susceptible to attack by the Douglas-fir bark beetle, we recommend that these stands be scheduled for harvest as quickly as possible. The currently planned timber sales will alleviate much of the hazard condition. If it is done within the next year, it would allow for salvage of

much of the existing mortality. This would also harvest the susceptible green trees before any further beetle outbreak would occur.

2. In the corridor of the North Fork of the Payette River canyon, the planned sale needs to be balanced against considerations for impact on the visual quality of the area. The impacts on big game cover and costs associated with helicopter logging also need to be considered. If the sale does take place in this corridor, we think it should be a much lighter cut than is presently marked for removal. Additionally, all non-Douglas-fir should be left on the site.

3. That portion of the existing Douglas-fir mortality that is near the top of the ridge on the east side of the river might be captured by salvage or direct sales using existing road systems.

APPENDIX A

SPRUCE BEETLE MANAGEMENT OPTIONS

Viable options for management of stands infested with spruce beetle:

(1) Salvage and sanitation of windthrow and infested trees

(2) Log susceptible high risk stands

(3) Trap trees in conjunction with logging

(4) Attractant pheromones in conjunction with logging

(5) Lethal trap trees

(6) MCH antiaggregative pheromone preventive treatment

(7) Combination of any or all of above

1. SALVAGE\SANITATION

Salvage of windthrown spruce should be given a very high priority as most outbreaks have originated from beetle populations that developed to high levels in slash (Schmid and Frye 1977). All types of slash, whether caused by nature, logging, road construction or other developments, have the potential to initiate and contribute to outbreaks. Removal of windthrow either before it becomes infested or prior to beetle emergence will contribute significantly to preventing the development of outbreaks. Schmid (1977) suggests the following management techniques for logging residues:

> Trees should be cut as low to the ground as possible to reduce stump height. Cull Logs and tops should be limbed and the branches kept away from the bark surface to expose it to the sun as much as possible. Cull logs and tops should be cut short, the shorter the

better, and exposed to the sun as much as possible to promote drying. Tops should be cut at three to four inches diameter.

Sanitation logging, i.e. removal of those trees that are infested with beetle life stages (larvae, pupae or adults), should also have a high priority. Removal of infested trees can contribute significantly to reduction of beetle populations, thus helping to prevent damage. Salvage of dead trees from which the beetles have emerged is important only for utilization of the resource. It needs to be done in a timely manner in order to avoid loss of value due to checking and decay.

2. SILVICULTURAL STAND MANIPULATION

Logging susceptible high risk stands should have a very high priority. **In many of the spruce beetle outbreaks that have occurred in the western states, once an outbreak has started, it has continued until a high percentage of the old growth spruce of the area has been killed.** In order to avoid these losses, IDL should actively pursue a sale program in currently uninfested old growth stands. Once an outbreak starts, even if it is controlled on IDL lands, there will often be adjacent infested lands of other ownerships, creating a high probability that the beetles will reinfest. Even when adjacent owners are working to control the beetles on their property there is a chance of missing some spots or of having incomplete control.

Before scheduling harvest activity, spruce stands can be rated for their potential to support spruce beetle outbreaks. High hazard stands can be identified and scheduled for the earliest harvest. The stands can be rated on the basis of physiographic location, tree diameter, basal area, and percent age of spruce in the canopy (Table I).

TABLE I. Risk categories for potential spruce beetle outbreaks by stand characteristics (Schmid and Frye 1976)

Risk Category	Physiographic Location	Average diameter of live spruce above 10 inches dbh	Basal Area	Portion of spruce in canopy
		Inches dbh	*Sq. Ft.*	*Percent*
HIGH (3)*	Spruce on well-drained sites in creek bottoms	>16	>150	>65
MEDIUM (2)	Spruce on sites with site index of 80 - 120	12 -16	100 - 150	50 - 65
LOW (1)	Spruce on sites with site index of 40 - 80	<12	<100	<50

* Number indicates arbitrary value to be used in calculating stand priority and is used only for convenience.

To calculate the rating for a stand, the risk values for each of the four characteristics are added together and compared to the following potential outbreak ratings (Table II) adapted from Schmid and Frye (1976). Stands receiving high ratings should be scheduled for harvest at the earliest opportunity.

Table II. Spruce Beetle Potential Outbreak Rating

Stand Risk Value	Potential Outbreak Rating
10 - 12	High
6 - 9	Medium
4 - 5	Low

3. TRAP TREES IN CONJUNCTION WITH LOGGING

Trap trees (felled, large diameter spruce trees) can be used in conjunction with salvage and timber sale operations to control movement of the beetles and help confine them to sites that are accessible for tree removal. The beetles are more attracted down timber than to standing trees. Trap trees are reported to attract beetles from up to 1/4 mile. Hauling the infested logs away before the beetles emerge will help reduce the beetle population and provide more time to pursue other management alternatives, i.e., harvesting of green timber before it is attacked. Trap trees have been used effectively to control beetle populations in smaller outbreaks (Gibson 1984) but may not be viable in large epidemics (Safranyik and others 1990).

The ratio of felled trap trees needed, related to standing infested trees per acre, is shown in Table III. Region 4, Forest, Pest Management, Boise Field Office suggests a general rate of one trap tree for each three infested trees.

Table III. Trap trees per acre needed based on existing attacked trees per acre.

RECOMMENDED NUMBER	
Existing Attacked Trees /Acre	Trap Trees /Acre Needed
<0.5	0/5
0.5 - 1.0	1.0
1.0 - 1.5	1.5
1.5 - 4.0	2.0
4.0 - 10.0	3.0

General trap tree guidelines are as follows:

a. Trap trees should be at least 20 inches dbh and felled so they are fully shaded. Fell the largest diameter spruce at each location.

b. A proportion of the trees should be felled so they surround the infested stands while the remainder are interspersed throughout the stands. However, the majority should be interspersed. Much of where the trap trees are dropped depends on stand conditions, i.e. shading and size of infestation, but every attempt should be made to encircle infested stands with trap trees.

c. Trap trees should be felled where they can be accessible for removal.

d. Fell single trees at each location; avoid felling groups of trees.

e. The trees are more attractive if they are felled in early spring rather than in the fall. They have to be in place before beetle flight in the spring, which usually takes place in early to mid May.

f. Avoid felling trap trees in particularly moist sites where they might partially sink into the ground.

g. Do not limb or buck the trap trees until they are to be removed.

The Canadians use this technique on a regular basis and have indicated that a trap tree is at least six times as attractive to the beetles as a standing tree, and at least six times as many beetles will get into the down tree. They also have determined that one trap tree will save 3-6 live trees from being attacked.

The Forest Service in Montana found that by baiting the trap trees with a pheromone attractant, the trees were attacked more densely and about two weeks earlier than unbaited trees.

It is imperative that trap trees be removed before the beetles emerge. If this does not happen, both the extent and intensity of the infestation may be increased.

Throughout most of its range, the spruce beetle has a two-year life cycle. Brood developing from attacks made in the spring will generally not make new attacks until two years later. This gives extra time for removing the logs if necessary, but it is best, where possible, to remove them in the fall of the same year in which they are cut. Warmer than normal summer temperatures can stimulate more rapid insect development leading to a one-year life cycle as opposed to the normal two-year cycle (Safranyik and others 1990). This emphasizes the desirability of removing trap trees the same year they are cut.

4. ATTRACTANT PHEROMONES FOR BAITING STANDING TREES

In areas scheduled for logging, it is feasible to bait standing, large diameter, green spruce trees. This would eliminate the expense and hazard of cutting trap trees. While these trees do not attract as many beetles as those that have been felled, there is much less work involved and many more trees can be baited. The baits cost approximately $6 each (1991).

5. LETHAL TRAP TREES

Lethal trap trees can be used in areas where the cost of developing access would not be beneficial. These trees are treated with a pesticide that kills the beetles as they bore into the tree, or by injecting cacodylic acid into the xylem of living spruce and subsequent brood dies. These trees do not require removal and processing to kill the beetles. **This procedure is only viable with light to moderate beetle populations.**

Standing, green, pheromone-baited trees, are sprayed with a 2 percent AI mixture of carbaryl in water. While the treated trees will serve as lethal traps, it is also recommended to treat nearby trees as spillover of the attacking beetles into adjacent trees may occur.

Silvisar 510 has been injected into the xylem of living trees which are later felled, and when attacked by spruce beetles, the subsequent brood fails to survive (Lister and others 1976).

6. PREVENTING ATTACKS WITH MCH PHEROMONE

The anti-attractant, MCH, which serves to prevent attacks by the Douglas-fir in windthrow, has also been shown to be effective against the spruce beetle (Kline and others 1974). MCH is currently undergoing registration process by the EPA. Once this is finalized, it will be available for use when windthrow occurs that cannot be salvaged.

APPENDIX B

DOUGLAS-FIR BEETLE MANAGEMENT OPTIONS

Viable options for management of stands infested or threatened by Douglas-fir beetle:

(1) Salvage of windthrow

(2) Silvicultural manipulation of stands

(3) Insect manipulation by pheromone baiting

(4) Timing of harvest

(5) Trap tress

(6) Preventing attack with MCH antiaggregative pheromone

1. SALVAGE OF WINDTHROW

Douglas-fir bark beetle outbreaks are usually initiated by catastrophic events, such as windthrow, blowdown, or winter breakage. The downed material caused by these events is very attractive to this beetle, which attacks and builds up large populations. New generations emerge and attack susceptible standing trees. Once an outbreak has started, it normally lasts about three years in that area, with the peak number of attacks occurring the second year. If other factors such as defoliation caused by the feeding activity of larvae of the western spruce budworm or Douglas-fir tussock moth, or drought, have weakened the trees, the beetle outbreak may be prolonged several years. **Timely salvage of down or severely weakened Douglas-fir is a primary tool in preventing Douglas-fir beetle outbreaks. This needs to be accomplished either before the beetles attack or before they can emerge the following spring. If trees are hauled out of the woods with beetles in them, they should be processed prior to beetle flight.**

2. SILVICULTURAL MANIPULATION OF STANDS

Generally, Douglas-fir stands grow for a long time without suffering losses to bark beetles. A few trees may be lost, especially where the trees are predisposed to attack by root rot, but overall damages are not usually great. Damage can become significant in mature stands where the trees are large, old, dense, and pure to Douglas-fir. Stands with these conditions are always at high risk of being attacked by the Douglas-fir beetle. Catastrophic events in these sites are usually the trigger that starts an outbreak. When this happens, the beetles build up populations in the downed trees and subsequently attack highly susceptible stands. Therefore, **reducing the risk factors prior to a catastrophe is the best loss prevention tool available.**

Stand susceptibility is based on average stand conditions. Those factors that contribute to susceptibility include:

Average age: equal to or greater than 90 years, high risk
Average size: equal to or greater than 18" dbh, high risk
Stand density: the greater the stand density, the higher the risk
Percent host in stand: the higher the percentage of Douglas-fir, the greater the risk

Reducing the risk of attack by the Douglas-fir beetle is best accomplished by reducing the high risk associated with these stand conditions through harvest cuts.

3. INSECT MANIPULATION BY PHEROMONE BAITING

When harvesting is contemplated in Douglas-fir stands, pheromone attractants can be used as baits to stimulate attacks of trees in a specific area that will then be cut and the logs hauled to mills for processing. This removes the beetles from the area and has been shown to be an effective tool in helping to maintain beetle populations at low levels. These attractant baits can be used in small clearcuts, right-of-way cuts, or in any other situation where the forester can be assured that the baited trees will be removed before flight the following spring. Since the beetles that are attracted to these baited trees almost always spill over and make attacks in adjacent unbaited trees, great care has to be taken in using the baits so that the beetles do not attack trees designated to be left on the site.

4. TIMING OF HARVEST

Another technique that has proven useful in managing beetle populations is to conduct the harvest activities, specifically the felling of the trees, in the spring of the year before beetle flight (usually early to mid May). This, in effect, provides a large supply of trap trees that attract and hold the beetles, keeping them from dispersing to other sites. Again, the removal of these trees has to be accomplished before beetles would fly the following spring.

5. TRAP TREES

The use of trap trees is a standard practice that can be used any time we suspect that there might be Douglas-fir beetles in the area. Trap trees can be either cut or baited with pheromones and left standing. Either of these techniques will contain the beetles at or near the site. This work needs to be done in the fall or very early spring before beetle flight. The beetles would then attack these baited or felled trees in the spring. For this technique to be effective, we also have to assure that these trap trees are removed within a year's time before the beetles are ready to emerge and attack standing green trees the next spring.

If felled trees are used, they should be cut in groups of 3 to 5 trees and should be a minimum of 15 inches in diameter, preferably larger. These trees should be felled into the shade as much as possible, as when they are felled into the sun, they do not serve nearly as well as an attractant to the beetles. These trees can be cut in the fall or spring and left in place until at least the next June of July. If possible, it is good to leave them until the middle of July; then they should be hauled away for processing. They can be left on the site longer if necessary but definitely should be removed from the woods before snow in the fall.

6. PREVENTING ATTACK WITH MCH ANTIAGGREGATIVE PHEROMONE

The Douglas-fir beetle produces 3-methyl-2-cyclohexen-1-one (MCH) as an antiaggregative pheromone to regulate the number of attacks in host tree. Synthetic formulations of MCH have proven very effective in preventing attack of the Douglas-fir beetle in windthrown trees (Furniss and others 1981). A 1984 Idaho Department of Lands/USDA Forest Service pilot project reduced attacks in windthrow by approximately 96 percent. When windthrow cannot be salvaged, the application of MCH will prevent build up of beetle populations in the down material and protect live, standing trees. At this time the Environmental Protection Agency is in the process of registering MCH to make it available for operational use.

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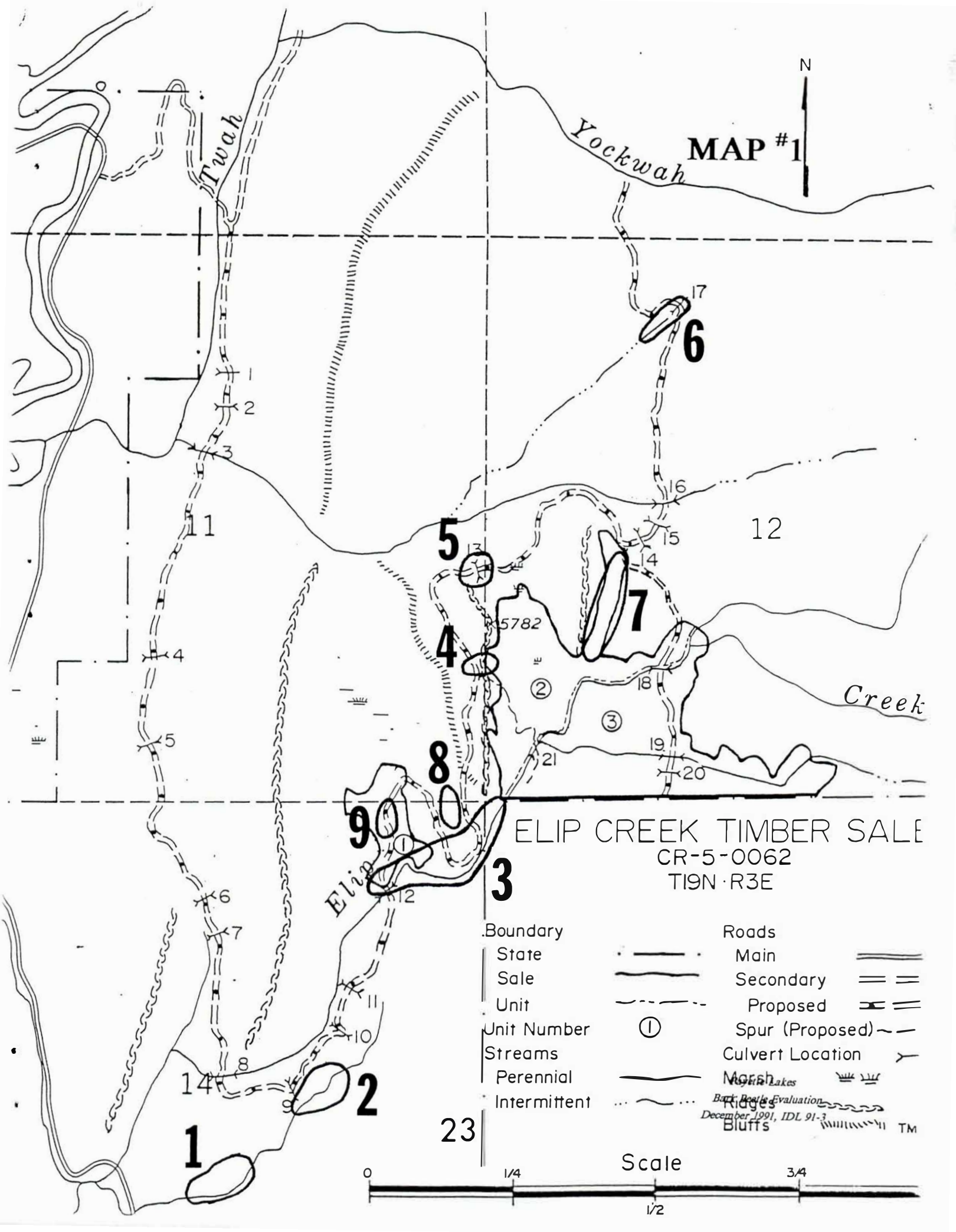
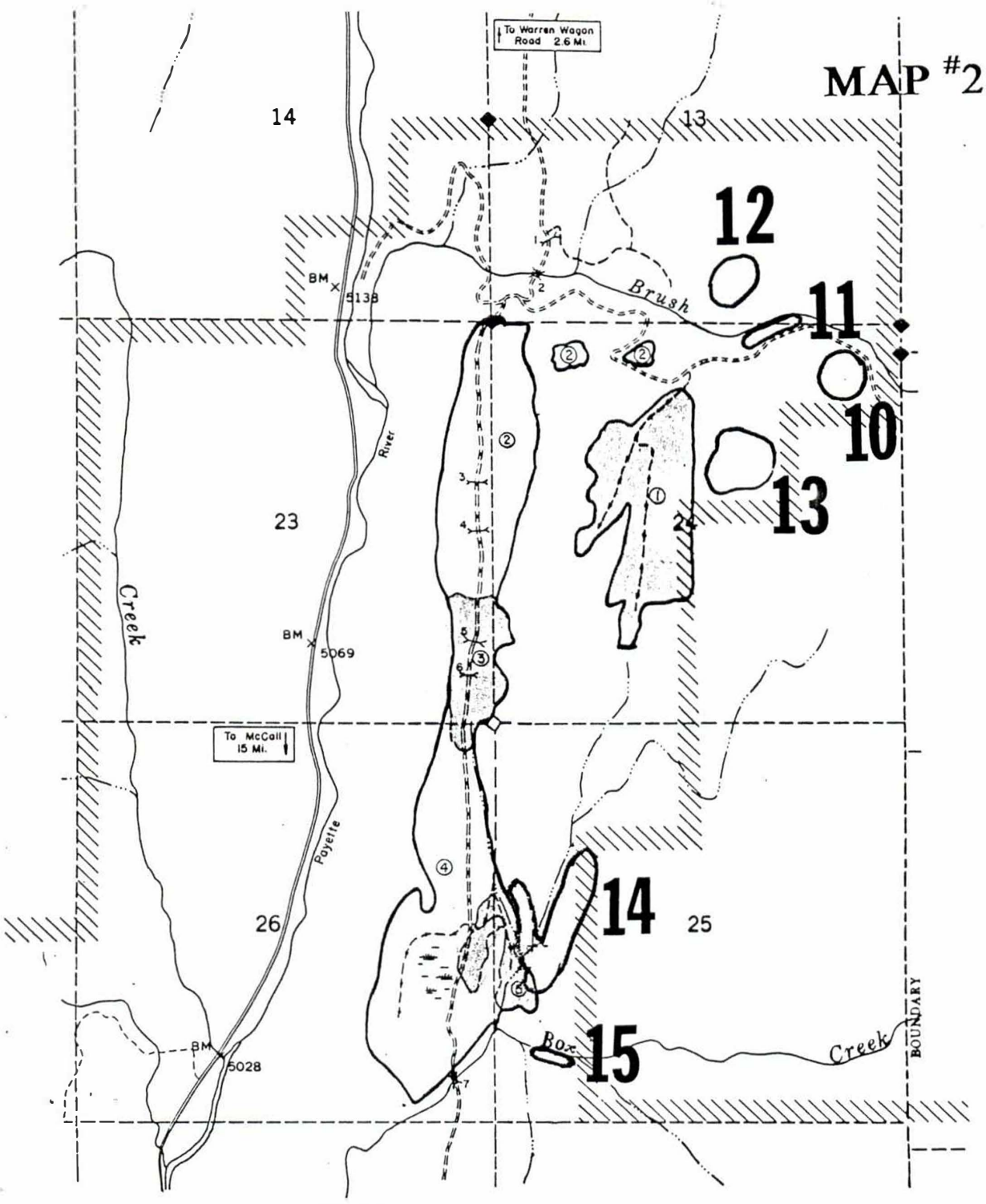

N
MAP #1
Twah
Yockwah
Creek
5782
11
12
23
ELIP CREEK TIMBER SALE
CR-5-0062
T19N · R3E
Boundary
State
Sale
Unit
Unit Number
Streams
Perennial
Intermittent
Roads
Main
Secondary
Proposed
Spur (Proposed)
Culvert Location
Marsh
Ridges
Bluffs
Scale
0
1/4
1/2
3/4
Battle Lakes
Basic Beetle Evaluation
December 1991, IDL 91-3
TM



BOX SADDLE TIMBER SALE
CR5-0045
T. 20N, R. 3 E.

LEGEND:

Roads
Primary
Secondary
Proposed
Spur (Proposed)
Sale Boundary
Cutting Unit Boundaries
Cutting Unit Numbers (3)
Clearcut Area

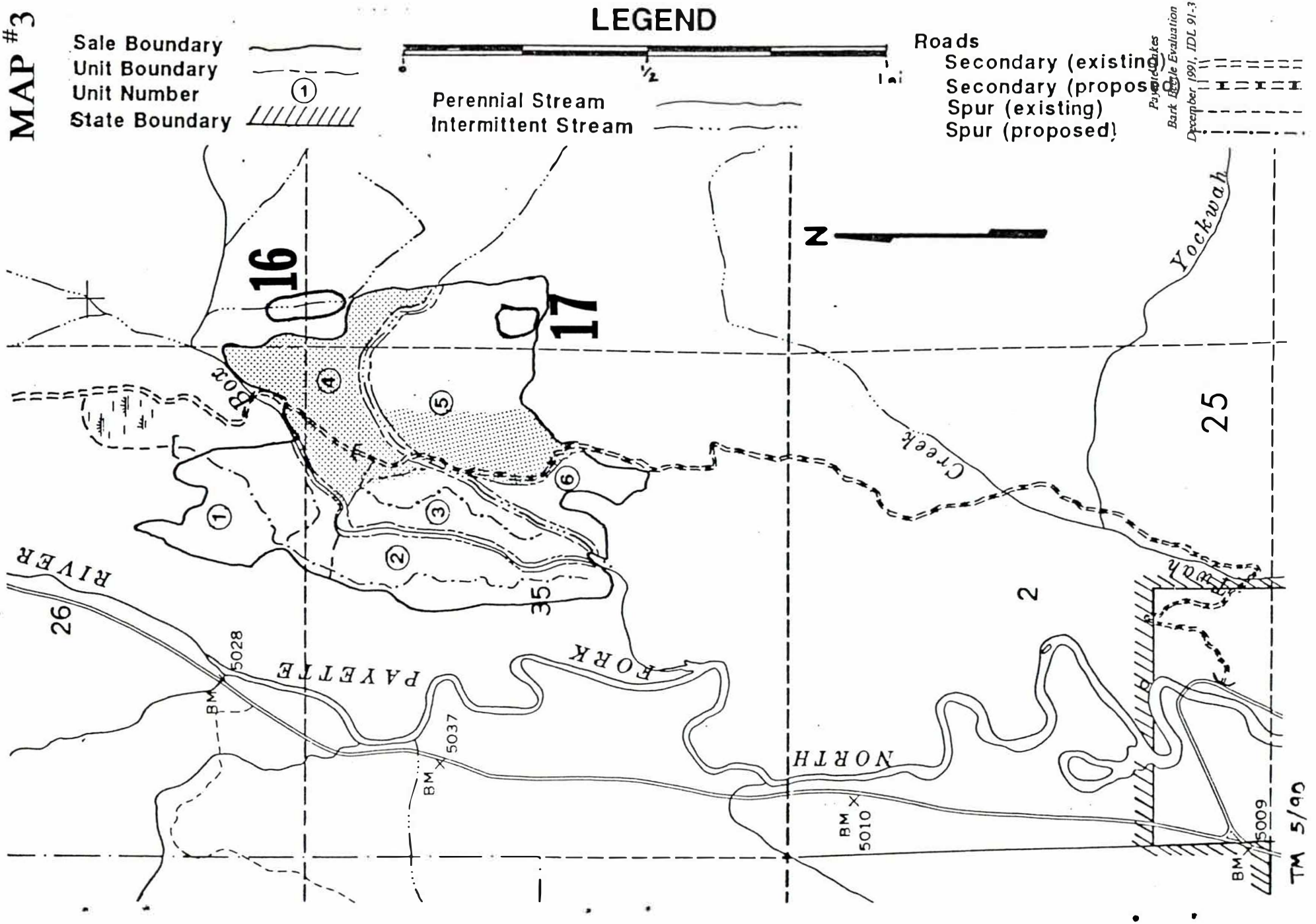
Corners
Brass Cap
Stone
Indicated
Culvert Location
Streams
Perennial
Intermittent
Marsh

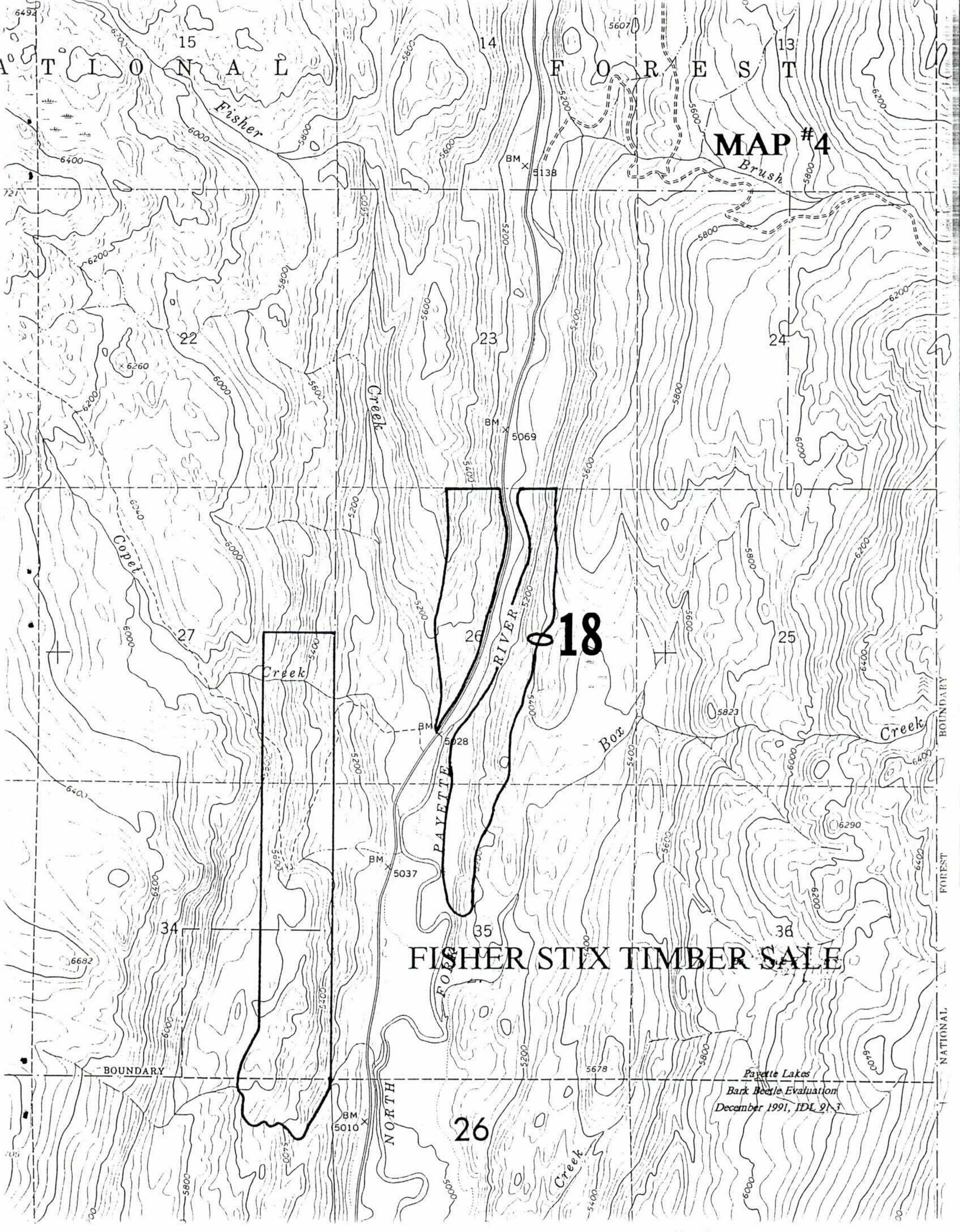
N

Miles 3/4 1/2 1/4 0 1000 2000 3000 4000 Feet 5000

Payette Lakes
Bark Beetle Evaluation
December 1991, IDL 91-3

BOX CREEK TIMBER SALE
CR-5-0061 -- T20N R3E




MAP #4
FISHER STIX TIMBER SALE
18
Payette Lakes
Bark Beetle Evaluation
December 1991, IDL 91-3
Fisher
Brush
Creek
Copel
Creek
Creek
Box
Creek
PAYETTE RIVER
FOREST BOUNDARY
NATIONAL FOREST
BOUNDARY
NORTH
BM 5138
BM 5069
BM 5028
BM 5037
BM 5010
15
14
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